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PANTROPICAL SPOTTED DOLPHIN (*Stenella attenuata*): Hawaiian Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Pantropical spotted dolphins are primarily found in tropical and subtropical waters worldwide (Perrin and Hohn 1994). Much of what is known about the species in the North Pacific has been learned from specimens obtained in the large directed fishery in Japan and in the eastern tropical Pacific (ETP) tuna purse-seine fishery (Perrin and Hohn 1994). These dolphins are common and abundant throughout the Hawaiian archipelago, particularly in channels between islands, over offshore banks (e.g. Penguin Banks), and off the lee shores of the islands (see Shallenberger 1981). Recent sighting locations from ~~aerial surveys around the main Hawaiian Islands (Mobley et al. 2000)~~ **a 2002 shipboard survey of waters within the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands** are shown in Figure 1 (**Barlow 2003**). ~~Nitta (1991) only documented three~~ **Twelve** strandings of this species **have been documented** in Hawaii **(Nitta 1991, Maldini 2003)**. Morphological differences and distribution patterns have been used to establish that the spotted dolphins around Hawaii belong to a stock that is distinct from those in the ETP (Perrin 1975; Dizon et al. 1994; Perrin et al. 1994b). Their possible affinities with other stocks elsewhere in the Pacific have not been investigated.

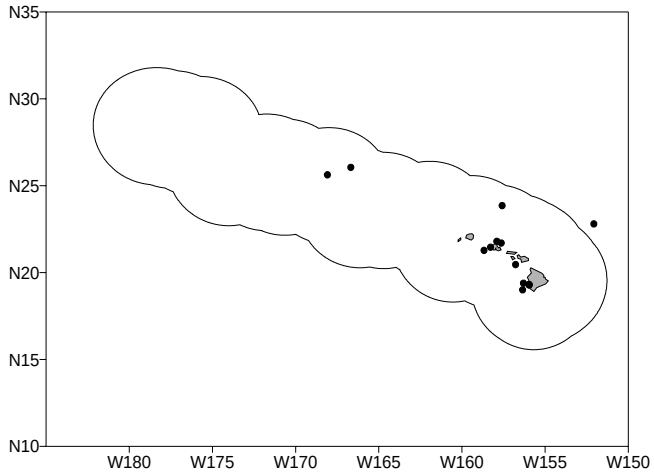

Figure 1. Pantropical spotted dolphin sighting locations during the 2002 shipboard survey of U.S. EEZ waters surrounding the Hawaiian Islands (Barlow 2003; see Appendix 2 for details on timing and location of survey effort). Outer line represents approximate boundary of survey area and U.S. EEZ.

Fishery interactions with pantropical spotted dolphins demonstrate that this species also occurs in U.S. EEZ waters around Palmyra Island (Figure 2), but it is not known whether these animals are part of the Hawaiian stock or a separate stock of pantropical spotted dolphins. Based on patterns of movement and population structure observed in other island-associated cetaceans (Norris and Dohl 1980; Norris et al.1994; Baird et al. 2001, 2003; S. Chivers, pers. comm.), the animals around Palmyra Island may represent a separate stock. Efforts are currently underway to obtain additional tissue samples of pantropical spotted dolphins for further studies of population structure in the North Pacific Ocean. For the Marine Mammal Protection Act (MMPA) stock assessment reports, there is a single Pacific management stock including only animals found within the U.S. ~~Exclusive Economic Zone (~~EEZ~~)~~ of the Hawaiian Islands. Spotted dolphins involved in eastern tropical Pacific tuna purse-seine fisheries are managed separately under the MMPA. **Information on pantropical spotted dolphins around Palmyra Island will provisionally be included with this stock assessment report, recognizing that separate stock status may be warranted for these animals in the future. Estimates of abundance, potential biological removals, and status determinations will be presented separately for U.S. EEZ waters of the Hawaiian Islands and Palmyra Island.**

POPULATION SIZE

Population estimates are available for Japanese waters (Miyashita 1993) and the eastern tropical Pacific (Wade and Gerrodette 1993). As part of the Marine Mammal Research Program of the Acoustic Thermometry of Ocean Climate (ATOC) study, a total of twelve aerial surveys were conducted within about 25 nmi of the main Hawaiian Islands in 1993, 1995 and 1998. An abundance estimate of 2,928 (CV=0.45) pantropical spotted dolphins was ~~recently~~ calculated from the combined survey data (Mobley et al. 2000). This abundance underestimates the total number of pantropical spotted dolphins within the U.S. EEZ off Hawaii, because areas around the Northwest**ern** Hawaiian Islands (NWHI) and beyond 25 nautical miles from the main islands were not surveyed. **Furthermore, the data on which this estimate was based are now over 5 years old.** ~~A line-transect vessel survey of the Hawaiian archipelago EEZ was completed in 2002~~

~~and is expected to provide a more comprehensive estimate of abundance for Hawaiian pantropical spotted dolphins in the near future~~. A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 10,260 (CV=0.41) pantropical spotted dolphins (Barlow 2003). This is currently the best available abundance estimate for pantropical spotted dolphins within the Hawaiian Islands EEZ.

No abundance estimates are currently available for pantropical spotted dolphins in U.S. EEZ waters of Palmyra Island; however, density estimates for pantropical spotted dolphins in other Pacific regions can provide a range of likely abundance estimates in this unsurveyed region. Published estimates of pantropical spotted dolphins (animals per km^2) in the Pacific are: 0.0046 (CV=0.41) for the U.S. EEZ of the Hawaiian Islands (Barlow 2003); 0.0407 (CV=0.45) for nearshore waters surrounding the main Hawaiian Islands (Mobley et al. 2000), 0.0678 (CV=0.15) and 0.1064 (CV=0.09) for the eastern tropical Pacific Ocean (Wade and Gerrodette 1993; Ferguson and Barlow 2003), and 0.0731 (CV=0.33) for the eastern tropical Pacific Ocean west of 120˚W and north of 5˚N (Ferguson and Barlow 2003). Applying the lowest and highest of these density estimates to U.S. EEZ waters surrounding Palmyra Island (area size = 347,216 km^2) yields a range of plausible abundance estimates of 1,590 - 36,928 pantropical spotted dolphins.

Minimum Population Estimate

The log-normal 20th percentile of the 2002 abundance estimate for the Hawaiian Islands EEZ (Barlow 2003) is 7,362 pantropical spotted dolphins. ~~combined 1993-98 abundance estimate is 2,040 pantropical spotted dolphins. As with the best abundance estimate above, this includes only areas within about 25 nmi of the main Hawaiian Islands and is therefore an underestimate~~. No minimum population estimate is currently available for waters surrounding Palmyra Island, but the pantropical spotted dolphin density estimates from other Pacific regions (Barlow 2003, Mobley et al. 2000, Wade and Gerrodette 1993, Ferguson and Barlow 2003; see above) can provide a range of likely values. The lognormal 20^{th} percentiles of plausible abundance estimates for the Palmyra Island EEZ, based on the densities observed elsewhere, range from 1,141 - 34,238 pantropical spotted dolphins.

Current Population Trend

No data are available on current population trend.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

No data are available on current or maximum net productivity rate.

POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for ~~this~~ the Hawaiian pantropical spotted dolphin stock is calculated as the minimum population size (~~2,040~~ 7,362) times one half the default maximum net growth rate for cetaceans (½ of 4%) times a recovery factor of 0.50 (for a species of unknown status with no known fishery mortality within the U.S. EEZ of the Hawaiian Islands; Wade and Angliss 1997), resulting in a PBR of ~~20~~ 59 pantropical spotted dolphins per year. No separate PBR can presently be calculated for pantropical spotted dolphins within the Palmyra Island EEZ, but based on the range of plausible minimum abundance estimates (1,141 - 34,238), a recovery factor of 0.40 (for a species of unknown status with a fishery mortality and serious injury rate CV > 0.80 within the Palmyra Islands EEZ; Wade and Angliss 1997), and the default growth rate (½ of 4%), the PBR would likely fall between 9.1 and 274 pantropical spotted dolphins per year.

HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fishery Information

Information on fishery-related mortality of cetaceans in Hawaiian waters is limited, but the gear types used in Hawaiian fisheries are responsible for marine mammal mortality and serious injury in other fisheries throughout U.S. waters. Gillnets appear to capture marine mammals wherever they are used, and float lines from lobster traps and longlines can be expected to occasionally entangle whales (Perrin et al. 1994a). ~~In Hawaii, no mortality of pantropical spotted dolphins has been observed in inshore gillnets, but these fisheries are not observed or monitored. Regulations governing the use of nearshore gillnets (lay nets) are currently under review by the State of Hawaii.~~

Interactions with cetaceans have been reported for all Hawaiian pelagic fisheries (Nitta and Henderson 1993). Between 1994 and 2002 one pantropical spotted dolphin was observed entangled and killed in the Hawaii-based longline fishery within U.S. EEZ waters, with approximately 4-25% of all effort observed (Table 1; Forney 2004). During the 905 observed trips with 11,014 sets, the average take rate of pantropical spotted dolphins was one animal per 905 fishing

trips, or one animal per 11,014 sets. Average 5-yr estimates of annual mortality and serious injury for pantropical spotted dolphins during 1998-2002 are zero outside of the U.S. EEZs, and 0.8 (CV=1.0) within the U.S. EEZ of Palmyra Island. No pantropical spotted dolphins were observed taken within the Hawaiian Islands EEZ during 1998-2002. One unidentified cetacean, which may have been a pantropical spotted dolphin, was also taken in this fishery within the EEZ of Palmyra Island (Figure 2, Forney 2004). Since 2001, the Hawaii-based longline fishery has undergone a series of regulatory changes, primarily to protect sea turtles (NMFS 2001). Potential impacts of these regulatory changes on the rate of pantropical spotted dolphin takes are unknown. ~~Between 1997 and 2001, one pantropical spotted dolphin was observed killed in the Hawaiian longline fishery (Figure 2), with approximately 4-23% of all effort observed each year. This extrapolates to an average interaction rate of 2.3 (95% CI = 1-11) pantropical spotted dolphins per year in the entire fishery (NMFS, unpublished data, Kleiber 1999). Although this animal was killed, not all interactions result in the death or serious injury of cetaceans. Cetaceans may ingest a hook, become hooked in the mouth or other body part, or become entangled in fishing line, causing varying levels of injury. Following the guidelines of a 1997 Serious Injury Workshop (Angliss and DeMaster 1998), small cetaceans that ingest a hook, are hooked in the mouth or head, are swimming abnormally, or are entangled and released trailing gear are considered seriously injured (defined under the MMPA as likely to result in mortality). The estimate of serious injury or mortality for pantropical spotted dolphins in the entire fishery during the five most recent years for which data are available (1997-2001) is 12 (95% CI = 1-55), or an average of 2.3 dolphins per year (NMFS, unpublished data, Kleiber 1999). Within the Hawaiian Islands EEZ, the annual rate of serious injury or mortality for pantropical spotted dolphins in the Hawaiian longline fishery during 1997-2001 is zero. One additional unidentified cetacean that may have been a pantropical spotted dolphins was hooked and injured outside the Hawaiian Islands . EEZ. The inclusion of this take would not increase the annual rate of serious injury or mortality for pantropical spotted dolphins within Hawaiian waters.~~

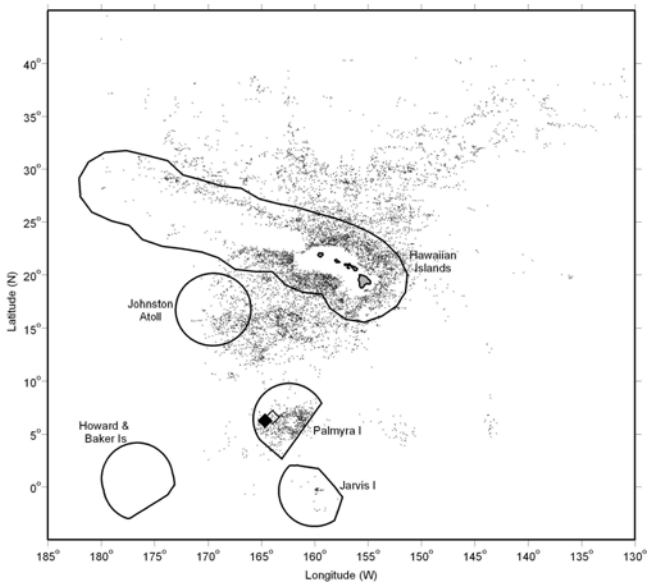

Figure 2. Locations of observed sets (small dots), pantropical spotted dolphin take (filled diamond) and a possible take of this species (open diamond) in the Hawaiian longline fishery, 1994-2002. Solid lines represent the U. S. EEZ.

Interaction rates between dolphins and the NWHI bottomfish fishery have been estimated based on studies conducted in 1990-1993, indicating that an average of 2.67 dolphin interactions, most likely involving bottlenose and rough-toothed dolphins, occurred for every 1000 fish brought on board (Kobayashi and Kawamoto 1995). Fishermen claim interactions with dolphins who steal bait and catch are increasing. It is not known whether these interactions result in serious injury or mortality of dolphins, nor whether pantropical spotted dolphins are involved.

Table 1. Summary of available information on incidental mortality and serious injury of pantropical spotted dolphins (Hawaiian stock) in commercial fisheries, within and outside of the U.S. EEZs (Forney 2004). Mean annual takes are based on 1998-2002 data unless otherwise indicated.

Fishery Name	Year	Data Type	Percent Observer Coverage	Observed and estimated mortality and serious injury of pantropical spotted dolphins, by EEZ region								
				Outside of U.S. EEZs			Hawaiian Islands EEZ			Palmyra Island EEZ		
				Obs.	Estimated (CV)	Mean Annual Takes (CV)	Obs.	Estimated (CV)	Mean Annual Takes (CV)	Obs.	Estimated (CV)	Mean Annual Takes (CV)
Hawaii-based longline fishery	1998	observer data	4.6%	0	0	0 (-)	0	0 (-)	0 (-)	0	0 (-)	0.8 (1.0)
	1999		3.5%	0	0	0 (-)	0	0 (-)		0	0 (-)	
	2000		11.8%	0	0	0 (-)	0	0 (-)		0	0 (-)	
	2001		22.7%	0	0	0 (-)	0	0 (-)		1	4 (1.0)	
	2002		24.9%	0	0	0 (-)	0	0 (-)		0	0 (-)	
Minimum total annual takes within U.S. EEZ waters									0.8 (1.0)			

~~**Other Removals**~~

~~At least 52 pantropical spotted dolphins were live-captured in Hawaii between 1963 and 1978 (Shallenberger 1981).~~

STATUS OF STOCK

The status of pantropical spotted dolphins in Hawaiian waters relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. No habitat issues are known to be of concern for this species. They are not listed as "threatened" or "endangered" under the Endangered Species Act (1973), nor as "depleted" under the MMPA. ~~Although information on~~ **The Hawaiian stock of** pantropical spotted **dolphins is not** ~~in Hawaiian waters is limited, this stock would not be~~ considered strategic under the 1994 amendments to the MMPA, because the estimated rate of fisheries related mortality or serious injury within the Hawaiian Islands EEZ is zero. **Although no estimates of abundance or PBR are currently available for pantropical spotted dolphins around Palmyra Island, the average rate of mortality and serious injury within the Palmyra Island EEZ (0.8 animals per year) is less than the range of likely PBRs (9.1- 274) for this region.** ~~However, there is no systematic monitoring of gillnet fisheries that may take this species, and the potential effects of interactions with the Hawaiian longline fishery in international waters are not known.~~ Insufficient information is available to determine whether the total fishery mortality and serious injury for pantropical spotted dolphins is insignificant and approaching zero mortality and serious injury rate.

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